

Chemical Experiments on Zoophytes; with some Observations on the component Parts of Membrane. By Charles Hatchett, Esq. F.R.S.
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Having completed the series of experiments on the component parts of shell and bone which he described in a former paper, it was suggested to Mr. Hatchett that there still remained a large class of substances belonging to the animal kingdom, namely, the various species of Zoophytes, which had never yet been carefully analysed, and the investigation of which would probably lead to some curious, and perhaps useful inferences. Although aware of the extensiveness of the inquiry, he yet readily engaged in it; and we have now before us the fruit of his indefatigable industry and ardent zeal for the advancement of science.

The first part of the paper contains a full account of the series of experiments he made on the abovementioned substances, which, in the present pressure for time, we must pass over unnoticed in order to hasten to the second, which consists of observations on those experiments, in the course of which the subject necessarily led to an inquiry into the nature and properties of several other analogous substances, such as horn, nail, hoof, quill, hair, feathers, tortoiseshell, the scales of fish, amphibious animals and insects, albumen, and even muscular fibre.

We must here recollect that in his former paper on shell and bone Mr. Hatchett had arrived at the conclusion that their essential ingredients were carbonate of lime in the former, and phosphate of lime in the latter, the bases in both consisting of different modifications of a glutinous, gelatinous, or membranaceous substance. This conclusion he had the satisfaction of seeing corroborated, and the chain of connexion widely extended, by the facts deduced from the present inquiry. The general results of which are, that the Madreporæ and Millepores (like several of the shells) are formed of a gelatinous or membranaceous substance, hardened by carbonate of lime, the difference consisting only in the mode in which these materials are combined: that in the Tubipora, Flustra and Corallina, some phosphate of lime is mixed with the carbonate of lime: that in the Isis the basis is a regularly organized membranaceous, cartilaginous and horny substance, hardened by carbonate of lime, one species only (the Isis ochracea) yielding also a small proportion of phosphate of lime. That the hardening substance of the Gorgonia nobilis is likewise the carbonate of lime, with a small portion of phosphate; but that the matter forming the membranaceous basis consists of two parts, the interior being gelatinous, and the external a complete membrane, so formed as to cover the stem in the manner of a sheath or tube. That the other Gorgoniæ consist of a horny stem coated by a membrane, which is hardened by carbonate of lime. That the Sponges are of a nature similar to the horny stems of the Gorgoniæ, and only differ from these and from each other by the quality of texture. And lastly, that the Alcyonia are likewise composed of a soft

flexible membranaceous substance, very similar to the cortical part of some of the *Gorgoniæ*; and in like manner slightly hardened by carbonate, mixed with a small portion of phosphate of lime.

From this mass of evidence we collect, in general, that the varieties of bone, shell, coral, and the numerous tribe of Zoophytes with which the last are connected, only differ in composition by the nature and quantity of the hardening or ossifying principle, and by the state of the substance with which this principle is mixed or connected; the gluten, or jelly, which cements the particles of carbonate or phosphate of lime, and the membrane, cartilage, or horny substance which serves as a basis, appearing to be only modifications of the same substance, which progressively graduates from a viscid liquid, or gluten, into a gelatinous substance, which again, by increased inspissation, and by the more or less perfect degrees of organic arrangement, forms the varieties of membrane, cartilage, and horn, which it seems form the peculiar differences of the several species.

It is obvious that in this inquiry much depends upon an accurate investigation of the gluten, or jelly, so often mentioned as a principal ingredient in the substances under examination. This gave rise to the experiments on the analogous substances above mentioned, which led to a better acquaintance with the substance which now obtains the name of *gelatin*.

Not being allowed to enter into a detail of these experiments, we shall only observe at present, that this gelatin is a component part of most of the animal substances above enumerated; that it varies in quality from a very attenuated jelly or mucilage, to that viscid substance called glue, the varieties of which also differ in solubility and tenacity: that it is present in various proportions, so that certain bodies, such as the cutis and cartilages of the articulations, seem to be entirely formed by it; while others, like nail, quill and tortoise-shell, can hardly be said to contain any; and that by its presence in various states and proportions, it may be regarded as the principal cause of those degrees of flexibility, of elasticity and of putrescibility, so various in different parts of animals.

In all these substances, when all the gelatin they contained had been separated, either by repeated boiling in water, or by being steeped in dilute acids, a more insoluble substance remained of a very different nature from the gelatin, and which became the object of another extensive analysis. The results here led to the curious and important conclusion, that the substance known by the name of albumen is in fact the primary animal matter from which all the others, and even the gelatin and the animal fibre, are ultimately derived, the formation of the two latter beginning with the process of sanguification in the fœtus, and the immense variety in the animal creation being deducible from the infinite diversity and modifications in texture, flexibility, elasticity, and other properties of the same substance composing the several parts which constitute the bodies of animals.